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1941

THE PAN-PACIFIC ENTOMOLOGIST

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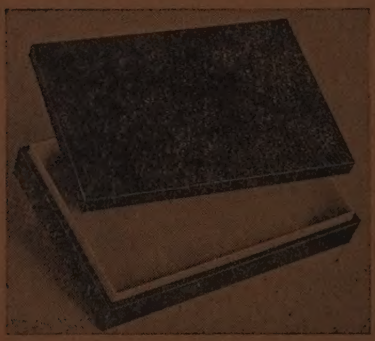

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NOTES AND DESCRIPTIONS OF NEOTROPICAL TRIATOMINÆ

(Hemiptera, Reduviidæ)

BY ROBERT L. USINGER

University of California, Davis

Since the appearance of a preliminary paper (Usinger, 1939) on blood sucking bugs of the subfamily Triatominæ, many additional notes and specimens have come to hand. Most of this material has been received through the generous cooperation of Messrs. H. G. Barber, E. Brumpt, S. C. Bruner, Luis Mazzotti, and S. F. Wood. To all of these, I wish to express my appreciation and thanks.

BOLBODERA SCABROSA Valdés

Bolbadea leabrusa Valdés Ragués, Anal. Acad. Cien. Med., Fís. Nat. Habana, 46:435, 1910. *Error of transcription.*

Bolbodera scabrosa Valdés Ragués, Cat. Mus. Cub. "Gundlach," p. 101, 1914.

Bolbodera scabrosa Uhler, MS., Bruner and Fracker, Ann. Ent. Soc. Am., 19:247-249, fig. 1, 1926.

Callotriatoma cubana Usinger, Univ. Calif. Publ. Ent., 7:33-56, 1 plate, 1939.

Mr. H. G. Barber has kindly called my attention to the description of *Bolbodera scabrosa.* This name was unfortunately omitted from the list of Neiva and Lent (1936) and all other accounts of this subfamily and was listed in the Zoological Record without comment as to its systematic position. Although I have not compared the type of *Bolbodera scabrosa* with *Callotriatoma cubana,* it seems certain that the two are identical. Hence the name *Bolbodera* should be substituted in my key to genera (1939).

The situation is even more complicated as indicated by Mr. S. C. Bruner who writes, "The description and figures were made from an old faded specimen (evidently a female) in a sealed glass-topped box in the Gundlach collection, Havana . . . I have learned since our article appeared that one Dr. Pedro Valdés

Ragués in the year 1910 published a paper entitled 'Clasificación Gundlach de Hemípteros Cubanos, Conforme a los Ejemplares que existen en el Museo del Instituto de 2ª Enseñanza de la Habana' (pp. 425 to 446, Anales, Academia Ciencias Med., Físicas y Naturales de la Habana, Tomo XLVI, Febrero, 1910). It is one of the most remarkable contributions I know of; scarcely a name is written as originally intended. Nevertheless, this so-called 'Gundlach Classification' exists, although Gundlach really wrote the labels correctly in German style script, following determinations made by Uhler in most cases . . . In describing *Bolbodera scabrosa* we unfortunately adopted Uhler's manuscript name. Now this appears in the Valdés paper (page 435) as follows (exact): '*Bolbadea leabrusa* 8 mm. algo ancho rojizo . . . 385.' The number is printed, so this is right." Metcalf (1936) treats the names of Valdés in the Fulgoroidea as *nomina nuda* but Bruner and Barber (1937) follow a strict interpretation of the rules for it is perfectly obvious that the remarks of Valdés, however brief, still constitute a description. The present case is further complicated because of the "error of transcription" of Gundlach's German script. However, we know the correct orthography of Uhler's manuscript name from several sources and Valdés himself spells the name correctly in a subsequent publication (1914) as indicated in synonymy above. I am further indebted to Mr. Bruner for copying portions of this 1914 paper for me.

Dimidiata Group

For many years the status of *Conorhinus maculipennis* Stål (1859) has remained in doubt because of Champion's misidentification of *dimidiata* (1899). Basing his conclusions entirely upon the extent of the corial markings, Champion considered Mexican specimens with only a small discal spot on the corium as typical *dimidiata*. Specimens from the same locality (Temax, Yucatan) with more extensive corial markings were designated as variety *a* with *maculipennis* as a synonym, while a single female from the same locality with the corium dark except on the "outer margin at the base and a space along the middle of the apical margin" was called variety *b*. Actually this variation approaches a continuum in the fine series before me collected, for the most part, by Dr. Luis Mazzotti. Moreover, this

entire series of Mexican specimens is smaller in size, 24½ to 28½ mm., than "typical" *dimidiata* from farther south. *Dimidiata* Latreille (1827) was described from Peru and specimens before me from Costa Rica and Panama agree with Latreille's description and figure. The length varies from 29 to 33 mm. and the head is often proportionately longer than in *maculipennis*. Stål called attention to these differences in 1859 and the extensive material which has come to light since that time indicates clearly that we are dealing at least with a geographically distinct subspecies.

Two other species of the *dimidiata* group have recently been discovered, both with ranges of distribution continuous with the widespread Central American and northern South American *dimidiata*. One of these, *hegneri*, was recently described by Mazzotti (1940) while the other is described below. The following key will aid in identifying members of the *dimidiata* group.

Key to the Species of the Dimidiata Group

1. Corium and connexivum in great part black, the corium infuscated basally as well as at middle and at apex and the connexivum pale only narrowly laterally in the region of posterior angles. Clavus at least obscurely infuscated even on apical half. Mexico.....*hegneri* Mazzotti
–. Corium and connexivum at least one-half yellow or orange-yellow, the base of the corium and apical half of the clavus always pale and immaculate. Connexivum yellow with more or less extensive black spots on antero-lateral portion of each segment 2
2. Head over twice as long[1] as wide across the eyes, 113::50; the eyes small, one-half to two-thirds as wide as interocular space; humeri distinctly angulately produced, subrounded at apices. Length 31 to 33 mm. Colombia.....*capitata* n. sp.
–. Head length subequal to, or shorter than, twice the width across eyes; eyes wider, four-fifths the width of interocular space or nearly equal to width of interocular space; humeri scarcely produced, distinctly rounded. Length 24½ to 33 mm. 3
3. Head subequal in length to twice the width across eyes. Length 29 to 33 mm. Costa Rica, Panama, and southward.....*dimidiata* (Latr.)
–. Head usually shorter than twice the width across eyes. Size smaller, 24½ to 28 mm. Mexico.....*maculipennis* (Stål)

[1] The length of the head is measured from extreme apex to, *but not including*, constricted neck region.

Triatoma capitata Usinger, new species

A large, relatively pale form with longer, more slender head, smaller eyes, and sharper humeral angles.

Head over twice as long (excluding constricted neck region) as broad across the eyes, 113::50; tylus narrowed anteriorly, broad and bulbous on basal half, with a broad depression at extreme base; juga scarcely attaining level of apices of antenniferous tubercles; lora not quite reaching apex of tylus; upper surface transversely rugose along the middle and punctate throughout, moderately elevated posteriorly; eyes one-third longer than postocular length of head to posterior constriction, 24::19, about half as wide as interocular space, 12::25; ocellar yoke located at extreme base of head just in front of constricted neck region; anteocular portion of head three and one-half times as long as postocular portion, 70::19. *Antennæ* inserted near middle of anteocular area, the ratio of distance from eyes to apex of antenniferous tubercles :: distance from antenniferous tubercles to apex of head as 33::37; first antennal segment reaching three-fourths of the distance to apex of head; proportion of segments one to three as 28:92:75, the fourth segment missing. *Rostrum* two-thirds as wide at apex of first segment as thickness of front femora at middle; proportion of segments one to three as 45:71:21; long hairs confined to apical segments. *Pronotum* about four-fifths as long on median line as total head length including neck region, 105::130; nearly half again as broad across humeral angles as long, 152::105; disk with anterior spines much as in *dimidiata*; humeral angles rather strongly produced and a little elevated or reflexed, apices rounded. *Scutellum* as in *dimidiata* but with anterior discal elevations more prominent, rounded. *Hemelytra* scarcely reaching tip of abdomen, two-sevenths broader at level of apices of coria than across base of coria, leaving an expanse of connexivum exposed on either side about one-sixth the greatest width across hemelytra; hemelytral surface nearly naked, with only a few very small and inconspicuous subappressed hairs. *Connexivum* likewise nearly glabrous but with a scattering of short, black, appressed hairs along lateral margins. *Under surface* much as in *dimidiata* but with the thorax less highly polished and the abdomen with sparser and slightly shorter hairs and less strongly flattened venter.

Color yellow and black, the hemelytra with black on basal third of clavus, a very small spot at middle of corium, and narrowly on apex of corium. Membrane dark fuscous. Connexivum black across basal third of each segment above and beneath, these black areas posteriorly widened medially. Edges of ventral abdominal plates yellowish to the spiracles and beyond them in front and behind. Elsewhere black except for paler third antennal segment, joints of legs, tarsi, and apical rostral segment which are lighter.

Size, male, length 31 mm., width (pronotum) 7½ mm., (connexivum) 10½ mm.; female, length 33 mm., width (pronotum) 7½ mm., (connexivum) 12 mm.

Collected at Miraflores (Boyaca), altitude 1450 m. (type locality); Malaga (Santander) altitude 2250 m.; Soata (Boyaca) altitude 2050 m.; and Toledo (Santander) altitude 1650 m., all in Colombia, S. A., and sent to me by Dr. E. Brumpt who is rearing the species at the Laboratoire de Parasitologie de la Faculté de Médecine de Paris. The female holotype is deposited as No. 5117, in the California Academy of Sciences. The male allotype is in my own collection.

Phyllosoma Group

The group of Triatominæ included in the genus *Meccus* Stål (type *phyllosoma* Burm.) proves to be less isolated than originally supposed and hence has correctly been relegated to synonymy. In the future the still more restricted group of species, excluding the recently rediscovered *mexicanus* H. S. (Mazzotti, 1940c), may best be referred to as the "phyllosoma group." This typically Mexican group has remained in the utmost confusion until recently because of the difficulty in identifying Burmeister's species and because of the tendency to lump everything under the single name, *phyllosoma*. Thanks to the assiduous field work and careful laboratory breeding done by Dr. Mazzotti a more rational picture has gradually emerged. It now appears that my *Triatoma picturata*, recently confused by various persons with *longipennis*, *phyllosoma*, and *pallidipennis*, is an extremely variable species as regards color pattern, some specimens having an entirely black pronotum instead of the typical pale posterior lobe while the orange markings of the connexivum vary greatly in extent. Members of the phyllosoma group may be distinguished from the other large (over 24 mm. in length) North and Central American Triatomas by their longer first antennal segment which reaches or surpasses level of apex of tylus and by the distinct curved black hairs which are either appressed or erect on the corium and which may be short and scale-like and scarcely as long as the interspaces between hairs or may be long and erect, reaching ½ mm. in length. The various species may be separated upon a sound morphological basis as follows.

KEY TO THE SPECIES OF THE PHYLLOSOMA GROUP

1. Upper surface clothed with relatively short hairs, those of the corium less than one-third mm. in length, curved and appressed and shorter or about as long as the interspaces between hairs.....2
–. Upper surface clothed with long, erect or suberect, slightly curved black hairs, those of the corium about one-half mm. long, much longer than the interspaces between hairs.....4
2. Abdominal venter and metasternum clothed with short, subappressed brown hairs; with long, black, backwardly directed hairs confined to the mesosternum. Venedio, Mazatlan..... .....*longipennis* Usinger
–. Abdominal venter and meso- and metasternum clothed with backwardly directed, slightly curved hairs, many of which are over one-half mm. in length.....3
3. Membranous apical half of clavus and most of corium white, the base of the corium tinged with orange and the base of clavus and narrow apex of corium black. Guerrero, Colima, Jalisco, Michoacan, Morelos, Mexico (Distrito Federal)..... .....*pallidipennis* (Stål)
–. Membranous apical half of clavus black. Corium black with very broad orange areas basally and subapically. Nayarit, Jalisco, Colima.....*picturata* Usinger
4. Hemelytra short, not exceeding fifth visible abdominal tergite. Orange connexival markings confined to posterior third or fourth of each segment and reaching lateral margins only at postero-lateral angles. Juchitan and Tehuantepec, Oaxaca .....*phyllosoma* (Burm.)
–. Hemelytra longer, reaching at least to middle of sixth abdominal tergite and sometimes exceeding tip of abdomen. Orange connexival markings occupying one-third to one-half of the posterior portion of each segment, including lateral margins. Pinotepa Nacional, Collantes, Tututepec and Alacranes, all in Oaxaca.....*mazzottii* n. sp.

Triatoma mazzottii Usinger, new species

A large orange and black species with strongly dilated connexivum, with much of the body covered by fine erect or backwardly directed black hairs which are much longer than interspaces between the hairs (½ mm. in some cases), and with the hemelytra nearly reaching or even surpassing the tip of abdomen.

Head nearly two and one-half times as long (excluding constricted neck region) as broad across eyes, 120::51; tylus tapering apically but only slightly enlarged near base, the head broadly, transversely depressed at the base of tylus; juga short, scarcely reaching level of apices of antenniferous tubercles; lora reaching

almost to tip of tylus; upper surface with a longitudinal row of transverse wrinkles and with moderately long, subappressed, curved, black hairs in front of eyes and much longer, suberect hairs posteriorly; the surface gradually elevated posteriorly and then depressed behind the eyes to ocelli; eyes only slightly longer than postocular length of head to posterior constriction, 24::22, and less than two-thirds as wide as interocular space, 14::22; ocellar yoke at posterior constriction of head but the ocelli extending well forward to the middle of postocular portion of head; anteocular portion of head three and one-half times as long as postocular portion, 75::21. *Antennæ* inserted exactly midway between the eyes and apex of head, the apices of antenniferous tubercles reaching just halfway from front margin of eyes to apex of head; first segment reaching beyond tip of tylus to extreme apex of head, second segment three times as long as first, 114::37, remaining segments broken off; first two antennal segments clothed with stiff black, moderately long, apically directed, subappressed hairs, without long erect hairs. *Rostrum* about two-thirds as wide at apex of first segment as front femur at middle, 11::18; proportion of segments one to three as 45:74:21. *Pronotum* (on median line) about one-seventh shorter than total length of head, 112::132; less than half again as broad across humeral angles as long, 162::112; constricted at middle to one-half the width across humeral angles, 82::162, then swollen on anterior lobe, the greatest width across lateral tubercles one-eighth greater than across constriction, 90::82; anterior collar strongly depressed and flattened, constricted behind to about one-half the greatest width of anterior lobe, 47::90, and then strongly anterolaterally produced as blunt spines, the total width across which is one-fourth greater than at the constriction of the collar; disk with very large, smooth wrinkles, with two stout, subacute spines in front of the middle of anterior lobe; sparsely clothed with exceedingly long, erect black hairs. *Scutellum* one-fourth longer than broad at base, 83::65; three-fourths as long as pronotum on median line, 83::112; apical spine scarcely elevated posteriorly and bluntly rounded at tip. *Hemelytra* long, reaching to apical third of last dorsal abdominal segment; only moderately widened posteriorly when at rest, one-fifth broader across widest point, a little before level of apices of coria, than at narrowest point just behind bases of coria, 170::143; clavus on basal half and corium throughout sparsely clothed with erect, slightly curved, black hairs which are well over one-half millimeter in length. *Connexivum* very broadly dilated, the abdomen appearing suboval in outline; broadly exposed, almost two-thirds broader than greatest width across folded hemelytra, 276::170; naked above and beneath except for very short, appressed, black hairs along lateral margins. *Under surface* highly polished and clothed with fine long backwardly directed hairs; mesosternum with a transverse, arcuate

elevation with its concave side directed posteriorly and sharply depressed; abdominal venter smoothly rounded or roundly flattened. *Legs* with shorter hairs than on most of the body, the femora with a pair of blunt spines subapically.

Color uniformly black with orange-yellow basally and subapically on the coria and on the basal half of each connexival segment extending slightly onto abdominal tergites and ventrites. Constricted neck region, apex of rostrum, tarsi, joints of legs, and probably last two antennal segments fulvous or paler.

Size, male, length 34 mm., width (pronotum) 8 mm. (connexivum) 14 mm.; female, length 35 mm., width (pronotum) 7½ mm. (connexivum) 14 mm.

Holotype, male, No. 5118, C. A. S., Ent., allotype, female, No. 5119, C. A. S., Ent., and three male paratypes, Tututepec, Oaxaca, Mexico, Luis Mazzotti collector. Other specimens from the type locality and Pinotepa Nacional, Collantes, and Alacranes, Oaxaca, are in the collection of Dr. Mazzotti, to whom this species is gratefully dedicated in appreciation of his outstanding work on the Triatominæ of Mexico.

One of the male paratypes is somewhat smaller (length 31 mm., width of pronotum 6¾ mm., of connexivum 12 mm.) with the membrane exceeding tip of abdomen by about one-fourth the length of last abdominal segment.

Mazzottii is closest to the true *phyllosoma* (Burm.) of which Burmeister (1835) said "Flugeldecken viel schmaler und kurzer der fast kreisrunde, zeimlichdicke Hinterleib." *Phyllosoma* differs in having a smaller pronotum, shorter hemelytra, and less extensive orange markings. Moreover, it is geographically isolated for Dr. Mazzotti writes, "I have collected it only in Juchitan, and Tehuantepec, Oax., localities of the Pacific coast of the Tehuantepec Isthmus. At the West of the Isthmus the coast advances into the ocean, and all that coast until the limits of the State of Guerrero is denominated 'Costa Chica de Oaxaca.' In that coast and very distant from the Isthmus, at Pinotepa Nacional, Oax., Collantes, Oax., Tututepec, Oax., Olacranes, Oax., etc., I have collected exclusively the long wing variety; I have never found this species at the Isthmus (Juchitan and Tehuantepec)." Since writing the above Dr. Mazzotti has received three more specimens of the true *phyllosoma*, this time from Totocapan "in the middle of the state to the South East from the city of Oaxaca." A map showing the distribution of these species is given by Mazzotti (1940a). His symbol indicating the *phyllos-*

oma with (*alas cortas*) is the true *phyllosoma*. It is possible that *mazzottii* may prove to be only a subspecies of *phyllosoma* but any further conclusions regarding its status must await breeding work in progress in the laboratory of Dr. Mazzotti.

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YELLOWJACKETS VERSUS CAMPERS

BY R. M. BOHART

University of California at Los Angeles

Vespula pennsylvanica (Saussure), a common western yellowjacket, was encountered in unusually large numbers this summer in the California Sierra and in other mountainous regions as far south as San Diego County. Reports from Lake Tahoe, Mammoth Lakes, Tuolumne Meadows, Kennedy Meadows (near Sonora Pass), Huntington Lake, Giant Forest, Mineral King, resorts on Mt. San Bernardino, and several points in the mountains of San Diego County indicate that this insect was the source of great annoyance to campers in July and August, far exceeding that of mosquitoes or other flies. According to quarantine officers stationed at Lake Tahoe, people moved from public camps at the north end of the lake "en masse" because of numerous stings and the necessity of having to compete with wasps for every mouthful of food eaten. Yellowjackets continuously feed their young with raw meat in the form of caterpillars, bits of dead fish washed up on lake and stream margins, or steaks from the dinner table. In hot weather thirst drives the adults to any place where water has been spilled and to the wet sand of bathing beaches. It was here that their presence resulted in annoyance to bathers and fishermen.

The number of persons stung was mostly limited to cases where the wasps were hit or squashed. Stings often resulted in painful swellings several inches across and inflamed at the center. The pain usually subsided after an hour or less and was followed by itching.

Fly spray guns were in great demand among campers, and local stores were early sold out. However, permanent relief was achieved only by destruction of the nests which were to be found under root arches, decomposing logs, and boulders. At Lake Tahoe this was safely accomplished by approaching the nest at night, dousing it with kerosene, and covering the area quickly and liberally with dirt.

The explanation for the unprecedented abundance of yellowjackets is purely a matter for conjecture, but the relatively mild winter and early spring may have been partially responsible. It is a good guess that with a normal winter this year the yellowjacket plague will become merely a matter of history and the mosquitoes will again come into their own.

APHIDIDÆ OF NEVADA WITH A NEW GENUS AND SPECIES

BY E. A. DREWS

University of California, Berkeley

This paper is the second dealing with aphids occurring in Nevada. Unless otherwise indicated the species were collected by the author. The writer is indebted to Professors E. O. Essig and M. A. Palmer for aid in determinations. Mr. W. W. Sampson gave considerable aid in description of the first instar of the new genus.

Aphis cerasifoliæ Fitch. On *Prunus demissa* (Nutt.) at Reno, Nevada, October 20, 1939.

Aphis lutescens Monell. On *Asclepias* at Idlewild Park, Reno, Nevada, October 21, 1939.

Aphis helianti Monell. On *Asclepias* at Idlewild Park, Reno, Nevada, October 21, 1939.

Aphis medicaginis Koch. On *Vicia* at Idlewild Park, Reno, Nevada, October 21, 1939.

Aphis rumicis Linnæus. On nettle at Idlewild Park, Reno, Nevada, October 21, 1939.

Aphis varians Patch. On *Ribes* leaves at Idlewild Park, Reno, Nevada, October 21, 1939.

Capitophorus potentillæ (Walker). On rose at Overton, Nevada, June, 1935. (Knowlton & Smith, p. 151, 1937).

Capitophorus rosarum (Walker). On wild rose at Wellington, Nevada, October 19, 1939.

Capitophorus xanthii (Oest). On *Xanthium canadensis* at Overton, Nevada, June, 1935. (Knowlton & Smith, p. 151, 1937).

Cinara engelmenniensis (Gillette & Palmer). On *Abies* at Genoa, Nevada, July 20, 1939.

Epameibaphis utahensis Knowlton & Smith. On *Artemisia tridentata* at Centerville, Nevada, September, 1939.

Mucrotrichaphis toti Knowlton & Allen. On *Artemisia* at Elko, Nevada, July 1, 1939. (Knowlton & Allen, p. 33, 1940).

Periphyllus utahensis (Knowlton). On *Salix* at Wellington, Nevada, October 19, 1939.

Phorodon menthæ (Buckton). On mint at Idlewild Park, Reno, Nevada, October 21, 1939.

Schizolachnus pini-radiata (Davidson). On pine at Centerville, Nevada, July 20, 1939.

Nevadaphis Drews, new genus

Apterous viviparous female. Front rounded; antennæ six-segmented, shorter than body, spur of VI about as long as base, or longer. Eye with reduced number of facets and with ocular tubercle large. Rostrum shorter than body. Cornicles very short, cylindrical, rims absent. Cauda apparently ovate and with long hairs, longer than length of cornicle.

First instar nymph. Antennæ four-segmented, shorter than body, a few prominent hairs, spur slightly longer than base, distal segment narrowly elongate, conical with sensoria forming a rosette with one large and five or six smaller ones. Eyes with reduced number of facets and with ocular tubercle large. Rostrum acute, nearly as long as body, apical segment very slender and long, remaining segments with a few prominent hairs. Cornicles very short, rimless, bases slightly narrower than tip. Cauda broadly rounded, wider than long, with two to four long hairs. Distal tarsal segment with four or five bristles longer than width of segment bearing them; proximal segment with two setæ on the top of the segment nearly as long as length of inner side. This first instar approaches none of those that are known from the Pacific Coast.

Genotype: *Nevadaphis sampsoni* Drews, new species.

In Nevsky's (1928, p. 4) key to the genera, *Nevadaphis* keys out to *Xerobion* and *Xerophilaphis* but fits neither genus. It differs from *Xerobion* in that no flocculent wool was evident, the cuticle is not markedly sculptured with hexagonal reticulations, the cornicles are cylindrical, not truncate, the cauda is longer, not shorter than cornicles, and ovate not bluntly-conical. It differs from *Xerophilaphis* in that no fine pruinose matter was evident, the cornicles are rimless, the cuticle is not plainly hexagonally reticulated, and the unguis of VI is about as long as base or longer.

Nevadaphis sampsoni Drews, new species

Apterous viviparous female. Body ovate but with head and thorax smaller than abdomen; color a dirty yellow to reddish-brown, often mottled; all hairs inconspicuous. Front of head rounded, without frontal tubercles; antennæ reaching just beyond third coxæ, secondary sensoria not present, a few simple hairs present, III generally shorter than IV or V, VI duskier than other segments. Eyes with reduced number of facets, ocular tubercle taking up about one-third of entire area of eye. Rostrum acute, reaching beyond third coxæ, with numerous long hairs arranged in two rows along its length. Lateral thoracic and abdominal tubercles present. Cornicles cylindrical, base usually

narrower than tip but at times slightly wider, about half as long as cauda, at times with one or two long hairs arising from basal area of cornicle. Cauda broadly ovate and with some hairs, usually about one-fourth the length of cauda. The following measurements are given in mm. Body: width 1.32, length 1.88. Appendages: antennal segments, I .067, II .063, III .180, IV .230, V .220, VI base .153, spur .167, rostrum .705, hind tarsi .118 (less claws), tibia .564.

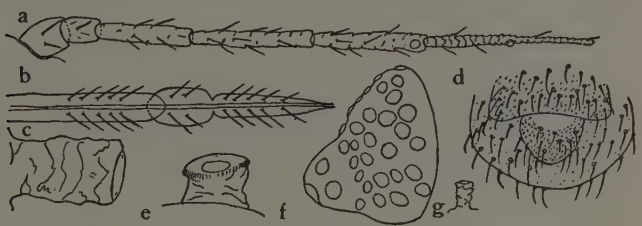

Figure 1. *Nevadaphis sampsoni* Drews, new species. a. antenna, b. rostrum, c. and g. cornicle, d. cauda, e. cornicle of first instar nymph, f. eye.

Segment III varies from shorter than IV to one-fifth longer than IV. V also ranges from shorter to one-tenth longer than IV. In the illustrations the two groups of figures a-d and e-g are drawn to different scales. All illustrations except f are of the apterous viviparous female.

Type, No. 4678, C.A.S., Ent. and paratypes in the collections of E. O. Essig, W. W. Sampson and the author, collected during September, 1939, and again on October 20, 1939, at Topaz Lake, Douglas County, Nevada, at an elevation of 5000 feet.

Collected rarely on the roots of *Artemisia tridentata* but abundant when present, feeding from the surface of the ground down to a depth of ten inches or more; sometimes attended by small ants. Although observed over a month previous to the date of collection, there was no evidence of sexual or alate forms.

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DISTRIBUTIONAL NOTES AND NEW RECORDS OF ACMÆODERA

(Coleoptera, Buprestidæ)

BY WILLIAM F. BARR
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During a recent collecting trip to southern California and southwestern Arizona made by R. G. Dahl, K. S. Hagen and the writer, a number of uncommon *Acmæodera* were taken in previously unrecorded localities. Along with these distributional records, host data, which should prove valuable for future collectors, were recorded. The writer would like to express his appreciation to Mr. Mont A. Cazier for his assistance and criticism. Thanks are also due to those who are mentioned as collectors of the specimens for allowing the writer to compile these data.

ACMÆODERA SABINÆ Knull

Acmæodera sabinæ Knull, 1937. Ent. News, 48:15-16.

This desirable little species was previously recorded by Cazier[1] from Holtville, California. Since the Holtville specimen was taken from an irrigation ditch, it seems desirable to record additional captures and host plants for this species. Five specimens were collected at San Luis, Yuma County, Arizona, June 15, 1940 (K. S. Hagen, R. G. Dahl and W. F. Barr), on *Pluchea sericea* (Nutt.); one specimen from Gordon's Well, Imperial County, California, June 17, 1940 (W. F. Barr), swept from *Larrea tridentata* var. *glutinosa* Jep.; and one specimen from Yermo, San Bernardino County, California, June 9, 1940 (W. F. Barr) on *Larrea tridentata* var. *glutinosa* Jep. The Yermo locality extends the known distribution of the species northward by about eighty miles and the California distribution (Holtville) by about one hundred and sixty miles.

ACMÆODERA JAGUARINA Knull

Acmæodera jaguarina Knull, 1938, Ann. Ent. Soc. Amer., 31(2): 135-136.

This species was described from a number of specimens, collected at Yuma, Yuma County, Arizona, in June and August. Two specimens were collected by the writer at San Luis, Yuma County, Arizona, June 15, 1940, on dead *Pluchea sericea* (Nutt.). About thirty specimens were collected at Thermal, Riverside County, California, June 17, 1940 (K. S. Hagen, R. G. Dahl and W. F.

[1] Cazier, M. A., 1940. Wasmann Collector, 4(1):28.

Barr), in the evening as they were flying to dead *Prosopis* branches. This is the first record of the occurrence of this recently described species in California.

Acmæodera hulli Knull

Acmæodera hulli Knull, 1928, Ent. News, 39:315.

Specimens of this species were collected for the first time in California at Cedar Canyon, Providence Mountains, San Bernardino County, California, June 10, 1940 (K. S. Hagen, R. G. Dahl and W. F. Barr), on *Prosopis*. One specimen was collected by the writer at Thermal, Riverside County, California, June 17, 1940, on dead *Prosopis*. This species was described from New Mexico and has also been collected in Arizona and Sonora, Mexico. The California specimens show unusual variation in the number and arrangement of the elytral maculations. Some specimens have six isolated spots on each elytron, some seven, and others eight. One specimen has the two subapical spots united longitudinally and the two middle spots united transversely, forming elongate spots.

Acmæodera pinalorum Knull

Acmæodera pinalorum Knull, 1930, Ent. News, 41:15-16.

This widely distributed Arizona species was collected for the first time in California at Cedar Canyon, Providence Mountains, San Bernardino County, California (K. S. Hagen, R. G. Dahl and W. F. Barr). Seven specimens were taken on *Prosopis*.

Acmæodera vulturei Knull

Acmæodera vulturei Knull, 1938, Ent. News, 49:228.

This species was recorded by Knull from Elizabeth Lake, Los Angeles County, California. Additional California records include: Pinon Flat, San Jacinto Mountains, Riverside County, California, May 24-26, 1939, and May 21, 1940 (B. Brookman, E. G. Linsley, E. S. Ross and C. D. Michener), taken on *Eriogonum fasciculatum* Benth. and Kernville, Kern County, California, June 7, 1940 (K. S. Hagen and W. F. Barr). Three specimens were taken on *Quercus*.

Acmæodera bivulnera Horn

Acmæodera bivulnera Horn, 1894, Proc. Cal. Acad. Sci., (2) 4:371.

Ten specimens of this uncommon species were collected at Ehrenberg, Yuma County, Arizona, June 14, 1940 (K. S. Hagen,

R. G. Dahl and W. F. Barr). One specimen was taken on *Larrea tridentata* var. *glutinosa* Jep. and the others on dead *Prosopis*.

Acmæodera yumæ Knull

Acmæodera yumæ Knull, 1937, Ohio Jour. Sci., 37(5):301.

Additional localities and hosts for this desirable species include three specimens from San Luis, Yuma County, Arizona, June 16, 1940 (W. F. Barr) taken on *Larrea tridentata* var. *glutinosa* Jep. and *Ephedra;* and five specimens from Gordon's Well, Imperial County, California, June 17, 1940 (R. G. Dahl and K. S. Hagen), taken on *Larrea tridentata* var. *glutinosa* Jep. and *Ephedra*.

Acmæodera fisheri Cazier

Acmæodera fisheri Cazier, 1940, Wasmann Collector, 4(1):19-20.

Since this species was described from a single specimen it seems worth while to record its capture at Thermal, Riverside County, California, June 17, 1940 (R. G. Dahl). One specimen was taken on *Pluchea sericea* (Nutt.). This locality is about one hundred and forty-five miles south of the type locality (Mojave). On this specimen, the scales on the pronotum are confined to the extreme lateral margins as compared to the type specimen which has the scales extended on to the disk. The scaling of the under surface is less dense than in the type specimen, but is nevertheless a dense felt-like tomentum. Also the punctuation of the pronotal disk is more evident and the elytral maculations are more extensive and more irregular in the Thermal specimen.

Acmæodera purshiæ Fisher

Acmæodera purshiæ Fisher, 1926, Ent. News, 37:114-115.

The range of this already wide-spread Great Basin species was further extended when it was collected at Pinon Flat, San Jacinto Mountains, Riverside County, California, May 21, 1940 (E. V. Stahl). A single specimen was collected on *Juniperus*. Previously the only southern locality was Bishop, Inyo Couty, California (Fenyes collection). The Pinon Flat locality extends the range southward by about two hundred and seventy miles.

Acmæodera inyoensis Cazier

Acmæodera inyoensis Cazier, 1940, Wasmann Collector, 4(1):18-19.

Two collecting trips into Nevada have extended the distribution of this species into that state. Eleven specimens were taken

in Kyle Canyon, Mount Charleston, Clark County, Nevada, May 23, 1940 (P. C. Ting, W. Reeves and M. A. Cazier), on desert mallow; two specimens were collected at Charleston Mountain Park, Clark County, Nevada, 9,000 feet, June 21, 1940 (R. M. Bohart).

ACMÆODERA ROSSI Cazier

Acmæodera rossi Cazier, 1937, Pan-Pac. Ent., 13(3):115.

Numerous specimens of this unusual *Acmæodera* were collected at the following localities: two specimens from twenty-three miles south of Vidal, Riverside County, California (K. S. Hagen and W. F. Barr) on palo verde; about ten specimens from Ehrenberg, Yuma County, Arizona, June 14, 1940 (R. G. Dahl, K. S. Hagen and W. F. Barr), collected on *Larrea tridentata* var. *glutinosa* Jep., dead *Prosopis* and dead *Acacia greggii* Gray; about thirty specimens from San Luis, Yuma County, Arizona, June 15-16, 1940 (K. S. Hagen, R. G. Dahl and W. F. Barr), taken on *Larrea tridentata* var. *glutinosa* Jep. and *Ephedra* and also found in an irrigation ditch; and seven specimens from Gordon's Well, Imperial County, California, June 17, 1940 (R. G. Dahl and W. F. Barr), taken on *Larrea tridentata* var. *glutinosa* Jep. and *Ephedra*.

As *Acmæodera* is a rather popular group and since there has not been any recent distributional paper written on it, the following state-by-state list seems desirable. The *Acmæodera* occur primarily in the southwest and adjoining states and as a result, only these few states are given for distributional purposes. The eastern and northern states have only one or two rather cosmopolitan species, i. e., *A. pulchella*, *A. ornata*, and *A. tubulus*, and therefore are not itemized individually. A summarization of the state lists shows the following:

	Total number of species	Endemics	Original type locality
California	64	28	46
Arizona	56	14	36
Texas	28	10	16
New Mexico	15	0	4
Nevada	15	0	1
Lower California	13	7	10
Utah	13	0	3
Northern Mexico	13	0	0
Colorado	6	0	1
Oregon	5	0	0
Florida	5	1	0

The exact type localities of *A. ornata* Fabr., *A. scalaris* Mann., *A. pulchella* Hbst., *A. flavomarginata* Gray, *A. rubronotata* Lap. & Gory, and *A. tubulus* (Fabr.) are unknown to the writer and the original literature is unavailable.

Only authentically determined specimens were used in this paper, therefore, it does not contain any of the doubtful localities which have appeared in earlier papers due to incorrect determinations.

CALIFORNIA[2]

1. *acuta* Lec.
2. *adenostomæ* Cazier
3. **alacris* Horn
4. *aliciæ* Fall
5. *angelica* Fall
6. **angelica nexa* Fall
7. **aurora* Fall
8. **barri* Cazier
9. biedermani Skinner
10. **bishopiana* Fall
11. *comata* Lec.
12. *connexa* Lec.
13. **coquilletti* Fall
14. cribricollis Horn
15. **dohrni* Horn
16. *dolorosa* Fall
17. **fenyesi* Fall
18. **fisheri* Cazier
19. flavosticta Horn
20. *gemina* Horn
21. gibbula Lec.
22. **guttifera* Lec.
23. *hepburni* Lec.
24. **holsteni* White
25. hulli Knull
26. **humeralis* Cazier
27. insignis Horn
28. *inyoensis* Cazier
29. jaguarina Knull
30. **jocosa* Fall
31. junki Thery
32. *labyrinthica* Fall
33. lanata Horn
34. *latiflava* Fall
35. *liberta* Fall
36. lucia Fall
37. **mariposa* Horn
38. **mariposa bernardino* Van D.
39. **morbosa* Fall
40. **nigrovittata* Van D.
41. **palmarum* Timberlake
42. **perlanosa* Timberlake
43. pinalorum Knull
44. *plagiaticauda* Horn
45. **postica* Fall
46. **prorsa* Fall
47. **pubiventris* Horn
48. pulchella Hbst.
49. **pullata* Cazier
50. purshiæ Fisher
51. **quadriseriata* Fall
52. quadrivittata Horn
53. *robusta* Horn
54. *robusta rubrosuffusa* Fall
55. *rossi* Cazier
56. sabinæ Knull
57. **simulata* Van D.
58. **sinuata* Van D.
59. *sinuata sexnotata* Van D.
60. **tenebricosa* Fall
61. tuta Horn
62. *vandykei* Fall
63. vulturei Knull
64. yumæ Knull

[2] Species marked with an asterisk are known only from the state under which they are listed. Names in italics indicate species originally described from the state. Species listed in Roman type occur in more than one state.

Arizona

1. acuta Lec.
2. aliciæ Fall
3. *amplicollis* Lec.
4. angelica Fall
5. *biedermani* Skinner
6. *bivulnera* Horn
7. *bowditchi* Fall
8. **carlota* Fall
9. comata Lec.
10. **conoidea* Fall
11. **constricticollis* Knull
12. **convicta* Fall
13. cribricollis Horn
14. *cuneata* Fall
15. *daggetti* Fall
16. *decipiens* Lec.
17. **delumbus* Horn
18. *discalis* Cazier
19. *disjuncta* Fall
20. *falli* Kerr
21. flavomarginata Gray
22. gemina Horn
23. gibbula Lec.
24. **gibbula gila* Knull
25. **griffithi* Fall
26. **horni* Fall
27. hulli Knull
28. insignis Horn
29. *jaguarina* Knull
30. *junki* Thery
31. liberta Fall
32. *ligulata* Cazier
33. **lineipicta* Fall
34. *lucia* Fall
35. **mimicata* Knull
36. opacula Lec.
37. ornata Fab.
38. **papagonis* Duncan
39. *parkeri* Cazier
40. *pinalorum* Knull
41. pulchella Hbst.
42. quadrivittata Horn
43. recticollis Fall
44. **resplendens* Van D.
45. rossi Cazier
46. *Sabinæ* Knull
47. scalaris Mann.
48. **serena* Fall
49. sparsa Horn
50. stigmata Horn
51. *subbalteata* Lec.
52. *varipilis* Van D.
53. *vulturei* Knull
54. **wheeleri* Van D.
55. *wickenburgana* Knull
56. *yumæ* Knull

Texas

1. *auritincta* Fall
2. bowditchi Fall
3. **consors* Horn
4. *cribricollis* Horn
5. discalis Cazier
6. disjuncta Fall
7. falli Kerr
8. **flavinigrapunctata* Knull
9. flavomarginata Gray
10. *gibbula* Lec.
11. **hæmorrhoa* Lec.
12. junki Thery
13. **macra* Horn
14. *maculifera* Horn
15. *miliaris* Horn
16. **neglecta* Fall
17. **obtusa* Horn
18. ornata Fabr.
19. *paradisjuncta* Knull
20. **perforata* Cazier
21. pulchella Hbst.
22. quadrivittata Horn
23. rubronotata Lap. & Gory
24. scalaris Mann.
25. **texana* Lec.
26. tubulus (Fabr.)
27. **uvaldensis* Knull
28. **wenzeli* Van D.

New Mexico

1. amplicollis Lec.
2. auritincta Fall
3. decipiens Lec.
4. gibbula Lec.
5. *hulli* Knull
6. lucia Fall
7. maculifera Horn
8. *opacula* Lec.
9. pulchella Hbst.
10. quadrivittata Horn
11. *recticollis* Fall
12. scalaris Mann.
13. sparsa Horn
14. subbalteata Lec.
15. *variegata* Lec.

Nevada

1. connexa Lec.
2. cribricollis Horn
3. gemina Horn
4. hepburni Lec.
5. inyoensis Cazier
6. labyrinthica Fall
7. lanata Horn
8. latiflava Fall
9. ornata Fabr.
10. *purshiæ* Fisher
11. robusta Horn
12. robusta rubrosuffusa Fall
13. tuta Horn
14. vandykei Fall
15. variegata Lec.

Lower California

1. **clausa* Horn
2. **faceta* Fall
3. flavomarginata Gray
4. *flavosticta* Horn
5. gibbula Lec.
6. *insignis* Horn
7. **lucana* Van D.
8. **opinabilis* Fall
9. **rubescens* Schaeffer
10. **scapularis* Horn
11. *stigmata* Horn
12. **vanduzeei* Van D.
13. *varipilis* Van D.

Utah

1. acuta Lec.
2. bowditchi Fall
3. cuneata Fall
4. dolorosa Fall
5. labyrinthica Fall
6. *lanata* Horn
7. lucia Fall
8. purshiæ Fisher
9. *quadrivittata* Horn
10. sparsa Horn
11. *tuta* Horn
12. vandykei Fall
13. varigata Lec.

Northern Mexico

1. bivulnera Horn
2. daggetti Fall
3. gibbula Lec.
4. hulli Knull
5. miliaris Horn
6. paradisjuncta Knull
7. parkeri Cazier
8. quadrivittata Horn
9. rubronotata Lap. & Gory
10. scalaris Mann
11. sparsa Horn
12. subbalteata Lec.
13. wickenburgana Knull

COLORADO

1. ligulata Cazier
2. lucia Fall
3. pulchella Hbst.
4. quadrivittata Horn
5. *sparsa* Horn
6. variegata Lec.

OREGON

1. angelica Fall
2. connexa Lec.
3. plagiaticauda Horn
4. sinuata sexnotata Van D.
5. variegata Lec.

FLORIDA

1. confusa Fisher
2. *marginotata Chev.
3. ornata Fabr.
4. pulchella Hbst.
5. tubulus (Fabr.)

THE GENUS ORTHOPODOMYIA THEOBALD IN CALIFORNIA

(Diptera, Culicidæ)

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While making observations and collections of *Aëdes varipalpus* (Coq.), "the Pacific Coast tree-hole mosquito," in southern California during February, 1940, larvæ and adults of the genus *Orthopodomyia* were encountered. The larvæ were in tree holes of cottonwood, *Populus fremontii* Wats., which had been filled by rains. Previous to this time *A. varipalpus* had been the only culicid known to inhabit tree holes in California.

Orthopodomyia is a small genus of mosquitoes whose members breed exclusively in tree holes. Only two species are known to occur in the United States, *Orthopodomyia signifera* (Coq.) and *Orthopodomyia alba* Baker. The former was described by Coquillett (1896) from the District of Columbia. Its present distribution includes most of the eastern and southern states from Massachusetts to Texas. A previous but unrecognized record of this species in California was made by Clara Ludlow (1906), who reported "*Culex*(?) *signifer*" from Benicia Barracks, Solano County. Howard, Dyar, and Knab (1917) stated, however, "We quote the California locality cited by Dr. Ludlow

with doubt, as no other specimens have been received or reported from west of the Plains." As a result subsequent workers have chosen to ignore the record. The writer on March 21, 1940, visited Benicia Barracks and vicinity in an attempt to recover *O. signifera*, but the only tree-hole mosquito found breeding in this area was *A. varipalpus*. *Orthopodomyia alba* was described by Baker (1936) from Ithaca, New York. Since then it has also been recorded from Alabama, Shields and Miles (1937).

The immature stages of *Orthopodomyia* were first collected in California at Riverside, Riverside County, on February 17, 1940, a large cottonwood tree with two rot holes was found which contained larvæ of *Orthopodomyia* and *A. varipalpus;* those of the former were obtained in all four instars, and 150 adults were reared from this collection. A second collection was made on the same day three miles to the south of Riverside, from a cottonwood tree which also contained larvæ of both mosquitoes. Subsequent collections of *Orthopodomyia* were made on June 30 and July 12 from the same tree holes. At the latter date larvæ of all four instars, pupæ, and adults were found.[1] Another locality was discovered on July 2 when larvæ of *Orthopodomyia*, *A. varipalpus*, and *Culex quinquefasciatus* Say were collected in cottonwood and willow tree holes two miles to the west of Redlands, San Bernardino County. From this material 621 fourth instar larvæ and 145 adults have been examined.

Study of the larvæ has shown the Californian species to be *O. signifera*, although certain variations from characters given for the eastern *O. signifera* (see Baker, 1936) have appeared. According to King, Bradley and McNeel (1939) the principal character separating the larvæ of *O. signifera* from *O. alba* is the presence of dorsal plates on segments six, seven, and eight (occasionally seven and eight) as contrasted with no plates in *O. alba*. In the Californian specimens dorsal plates are not always present on abdominal segments six, seven, and eight. Of the fourth stage larvæ examined only 60 had plates on these segments, 368 had plates on segments seven and eight, and 243 had a plate on only the eighth segment. Of the latter group 59 later added a plate on the seventh segment, and three added plates on segments six and seven. Addition of plates takes place without

[1] Breeding apparently occurs continuously in the tree where the original collection was made as on August 27 larvæ were still abundant, and adults were observed resting on the inner surface of the hole.

moulting and is apparently a hypodermal deposition the physiological nature of which is unknown. The number of teeth in the anterior row of the comb of the eighth abdominal segment varies from 13-22, as contrasted with previous descriptions of 17±2 (*signifera*) and 11±2 (*alba*). This variation and that recorded by Shields and Miles (1937) for *O. alba* of an increase to 18 would indicate that the character is of little value in differentiating *O. signifera* from *O. alba.*

The character of hypodermal pigmentation given as pink or purple for *O. signifera* and lacking for *O. alba* has been found in California to depend entirely upon larval diet. In sunny tree holes an abundant growth of *Thiocapsa,* a rose pink pigmented bacterium occurs. Larvæ from holes containing this pigmented organism have a purple or pink hypodermal coloration. Removal from such a hole and changing to a yeast diet results in loss of this pigmentation, and they become yellow to brown. These larvæ when placed in a container with the pigmented organisms become pink again within a week.

In other characters larvæ agree with those of typical *O. signifera.* General hairy appearance inconspicuous. Head capsule rounded, dark brown; antennal tuft inconspicuous, of three to five hairs; sub-basal tuft inconspicuous; transutural tuft single. Abdomen with lateral tufts of the first two abdominal segments short and multiple. Ventral tuft of sixth abdominal segment composed of seven to thirteen hairs. Siphon about three and one-half times as long as wide, slightly tapered; siphonal tuft with five to eight hairs. Anal segment completely ringed by its plate. Anal gills long and tapering.

Pupæ of the Californian *O. signifera* are brown with darker intersegmental bands. Those from larvæ with considerable pink pigmentation are especially dark. The respiratory trumpet is not so angular in outline as typical *O. signifera* because the sides are gently curved. However, in some cases the corners are sharp in outline.

Considerable difficulty has generally been experienced in separating the adults of *O. signifera* from *O. alba* (see Baker, 1936). The former has been described as having the cuticula of the first abdominal tergite purplish brown, a continuous apical black band on the second abdominal tergite, and abdominal

tergites from the third segment posteriorly with white basal triangular patches laterally. *O. alba* differs by having the cuticula of the first abdominal tergite yellow, triangular black apical areas laterally on the second abdominal tergite, and abdominal tergites from the third segment posteriorly with continuous white basal bands. The Californian specimens exhibit a marked trend towards *O. alba.* The cuticula of the first abdominal tergite is yellowish brown. In many specimens the second abdominal tergite is completely white scaled, but in the majority of cases there are dark, apical triangular areas laterally; the second abdominal tergite has a continuous apical black band in less than 20 per cent of the specimens. Abdominal tergites from the third segment posteriorly possess continuous white basal bands in 90 per cent of the specimens, and in only the remaining 10 per cent are basal triangular white patches found laterally.

Male terminalia agree with descriptions of *O. signifera,* except that the basal lobe has three to five large stout spines instead of only three; the majority have four as found in *O. alba.*

Adult specimens have been placed in the collections of the United States National Museum, the California Academy of Sciences, and the University of California. The writer is indebted to Dr. T. H. G. Aitken for verification of his determination and to both him and Prof. W. B. Herms for reading the manuscript.

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THE UNIVERSITY OF CALIFORNIA ENTOMOLOGICAL SOCIETY
and
THE ENTOMOLOGIST'S DAILY POST CARD

BY E. O. ESSIG

University of California, Berkeley

The University of California Entomological Society, which appears to have been the second[1] entomological organization formed in California, held its first business meeting and adopted by-laws at the University of California, Berkeley, January 3, 1895. Officers elected were: President, E. J. Wickson; Vice-President, J. J. Rivers; Secretary and Editor, C. W. Woodworth. New members elected were: B. M. Lelong, Alexander Craw, Dr. H. H. Behr, Dr. E. C. Van Dyke, Prof. A. J. Cook, C. H. Shinn, and W. G. W. Harford.

According to Article 1 of the by-laws, "the object of this Society shall be to advance the science of Entomology in all its branches."

The official organ of the Society was "The Entomologist's Daily Post Card," which is referred to as "A California Journal of Entomology"—the first entomological publication in the state. It was published on cards, each daily issue (published daily at first and subsequently issued weekly, beginning April 1, 1895) consisting of printing on both sides of a substantial card 3¾x5½ inches. The issues were intended "to form a card index to the insects of California and adjoining states." Many early records of insects appearing in this journal have been overlooked by entomologists. The contents included timely information and announcements and usually a synoptical key to a genus, family, or order of insects or a title of some recently published outstanding paper in entomology. In the first number appeared this interesting statement: "The two things most needed for the study of Entomology in California are a series of synopses of our species and a bibliography of our literature." Among other notes are, "A new insect box" (No. 3, Jan. 4, 1895); "Hints for Teachers" (Nos. 5-6, Jan. 7-8, 1895); "Microscopical mounts of insects"—refers to the possibilities of "mount-

[1] The California Entomological Society was founded at San Francisco on March 13, 1891, and The Pacific Coast Entomological Society was first organized as The California Entomological Club in the same city on August 7, 1901.

ing insects of considerable size for microscopical study" (No. 8, Jan. 10, 1895); "An entomological game" (No. 28, Feb. 2, 1895); "Lamp chimney for breeding cages" (No. 30, Feb. 5, 1895); "Reference Collections—refers to the Ricksecker collection of Coleoptera and the Rivers collection of Lepidoptera at the University of California (Nos. 35-36, Feb. 11-12, 1895); "The orders of insects" (Nos. 71-76, March 27-April 2; Nos. 111-112, May 16-17, 1895); "The Smyrna fig insect" (Nos. 94-95, April 24-25, 1895); "Experiment Station entomologists" (Nos. 106-107, May 9-10, 1895); "Arsenites in Bordeaux Mixture"—in which attention is called to the fact that Prof. C. P. Gillette "first called attention to the possibility of applying an arsenite as Paris green in Bordeaux mixture with even greater safety to the plant than when applied alone, and thus save the cost of one application" (No. 26, Jan. 31, 1895). A vacation notice in No. 118, May 23, 1895, closed the series.

There is nearly a complete set of this journal in the archives of the University of California Library and the author has a set with but a single card missing. The cards have greatly deteriorated and are browned with age. The writer is able to furnish almost complete sets to libraries.

TRIGONOPTERUS IN THE CAROLINE ISLANDS

(Coleoptera, Curculionidæ)

BY ELWOOD C. ZIMMERMAN

Bernice P. Bishop Museum, Honolulu

The cryptorhynchine genus *Trigonopterus* (=*Idotasia*) contains more than 80 species which are distributed from Sumatra to Samoa with the greatest development in Papua. None have heretofore been recorded from Micronesia. Bishop Museum's Micronesian Expedition of 1935-1936 procured the following striking new species of the genus from the Caroline Islands.

Trigonopterus carolineæ Zimmerman, new species

Figure 1

Color: head, rostrum, club of the antennal scape, prothorax, coxæ, trochanters, bases of and usually the edges and apices of the femora, mesosternum, sides of the metasternum, basal margin and apices of the elytra black, elsewhere mostly brownish-red, the

elytra conspicuously shiny brownish-red and contrasting sharply with the shiny black pronotum, the elytra transluscent; setæ yellowish to golden.

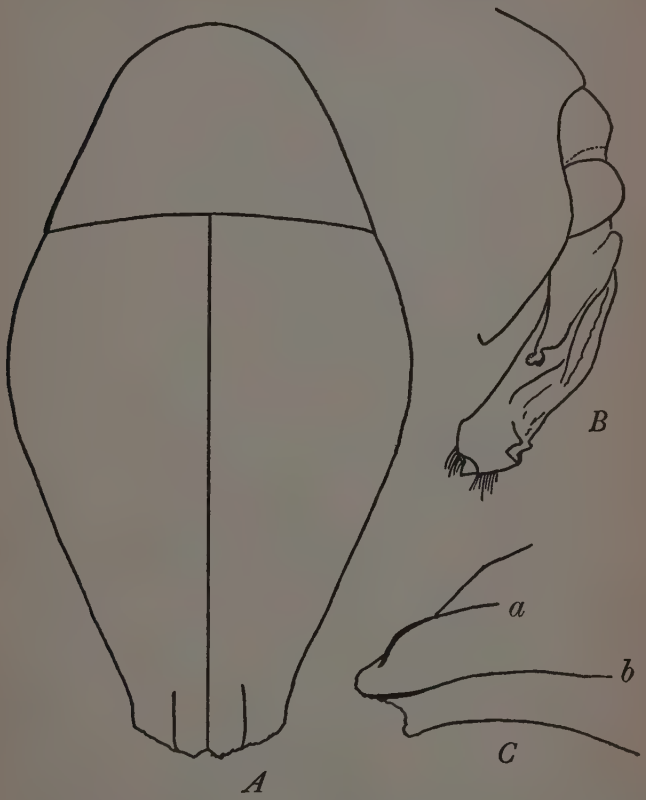

Figure 1. *Trigonopterus carolineæ* Zimmerman, new species. A, lateral outline; B, outline of head and rostrum; C, outline of side of apex of elytron, *a*, elevated second interval, *b*, elevated and coalesced intervals 7, 8 and 9.

Head reticulate, rather dull, the crown coarsely and densely punctate except near the pronotum; interocular area broadly, shallowly and conspicuously concave, with a very deep, coarse groove around each eye, the eyes therefore appearing protuberant, the middle of the area impunctate, the punctures on the sides and

below the middle longitudinally confluent. *Rostrum* in the male coarsely reticulate and dull throughout, with three strongly developed, coarse carinæ, exclusive of the carina above each scrobe, running from near the base to beyond the antennal insertion, the intercarinal striæ coarse, punctate, each bearing a row of erect setæ; at about one-fourth from the apex there are three conspicuous, dorsal, tubercle-like prominences on an arc of an apparent transverse ridge which are remnants of the three dorsal carinæ which have become obsolete or almost obsolete just behind the tubercles where the rostrum is depressed (see fig. 1, B); rostrum of the female more slender, the dorsal carinæ not continued beyond the antennal insertion, and from there distad rather shiny and with lines of moderately large punctures being continuations of the striæ behind the antennæ, without subapical tubercles. *Antennæ* with the scape sinuous, strongly clavate, as long as the first four funicular segments, its broadest part two and one-half times as broad as the narrowest part of the stalk; first funicular segment as long as 2, 2 about as long as 3 plus 4 plus 5, 3 to 7 each successively slightly broader; club broadly rounded at the apex, one-fourth longer than broad, about as long as the preceding five funicular segments. *Thorax* five-eighths as broad as long, base slightly sinuous, the sides evenly converging in an almost straight line to the convex apex; dorsum with a variable, rather inconspicuous impunctate median line, elsewhere closely and evenly set with medium sized oval punctures whose interstices are mostly narrower than the punctures, each puncture containing a fine, decumbent, anteriorly directed seta that hardly projects beyond the anterior margin of the puncture; dorsum evenly convex transversely and longitudinally, without a subapical constriction. *Elytra* shaped as illustrated, one and one-half times as long as broad, not quite three times as long as the prothorax, measured from the side (14:5), dorsal and lateral outlines continuous or almost continuous with those of the pronotum; none of the striæ excepting the eighth obviously impressed in the basal two-thirds, marked by series of small punctures, the punctures and the flat, broad intervals bearing miscroscopical setæ; stria 8 impressed and coarsely punctate from the base nearly to the second ventrite, the outer side of the stria appearing as a shelf-like ridge, the outer stria obsolete from the base about to the hind margin of the first ventrite, then becoming deeply impressed from the third ventrite to the apex; interval 2 elevated at the apex for about the length of the fifth ventrite, intervals 7, 8 and 9 forming a coalesced elevation from above the fourth ventrite to the apex, a continuation of this elevation runs from the latero-apical corner to the suture, the true margin is therefore below and anterior to the apparent margin, the area between the elevation and the margin concave; the elytral apices forming a common, variable, emargination at the suture; some of the setæ

in the hollow between the distal elevations of the coalesced intervals 7, 8 and 9 and interval 2 usually squamiform and elongate oval in shape. *Legs* with the femora not expanded distally, the punctures bearing conspicuous, prostrate setæ lying parallel to the long axis, with a stria along the lower outer margin in which the setæ are more numerous, the lower sides flattened and only shallowly concave, the outer edge not elevated into a conspicuous flange; tibiæ, excepting for the basal angulation, almost straight, each with the uncus developed and appearing to arise somewhat nearer the inner than the outer corner, none with a distinct tooth at the inner apical angle, although that angle may be acute, the fore pair with some irregular, sinuous, longitudinal carinæ between the well developed dorsal and ventral marginal carinæ on the outer side and without a very conspicuous longitudinal patch of golden setæ as found on the mid and hind tibiæ, mid and hind tibiæ without distinct carinæ on the outer side between the marginal carinæ, with more than the apical fourth of the outer side occupied by a large, conspicuous patch of stiff golden setæ that conceal an oblique carina; tarsi with the first segment slightly longer than the third, twice as long as the second, the third fully one-third broader than long and fully as long as the preceding two segments, dorsa of all segments with long, stiff setæ. *Sternum* coarsely reticulate, with the posterior surface of the mesosternal receptacle with conspicuous plumose squamæ in the male, but with simple hair-like setæ in the female; metasternum broadly concave in both sexes and with a few scattered setiferous punctures, the anterior edge broadly arcuate, about two-thirds as long along the median line as the first ventrite; mesocoxæ separated by a distance about one-fifth greater than the transverse chord of a mesocoxa. *Venter* reticulate like sternum; with the first two ventrites broadly and shallowly concave in the female, the second ventrite almost flat, both ventrites more deeply concave in the male; first ventrite with the intercoxal margin broadly arcuate, with small, scattered setiferous punctures, about as long along the median line as ventrite 2 plus one-half of 3; second ventrite as long as 3 plus 4, ventrites 2, 3 and 4 with small scattered setiferous punctures; ventrite 5 broadly concave, clothed with a dense mass of erect, thin, broad, plumose squamæ which almost completely covers the ventrite in the male but is wanting from the basal median area in the female. Length: 4.0-4.5 mm.; breadth: 2.0-2.25 mm.

Caroline Islands: Ponape Island, holotype male, allotype female and one male paratype in Bishop Museum, collected by Z. Ono at Wone, February 17, 1936.

This is a very distinct and striking species. The shiny reddish elytra make a strong contrast with the black pronotum. I know of no other species to which it is closely allied or which it resembles.

A NEW CALIFORNIAN STENOPOGON

(Diptera, Asilidæ)

BY BERNARD BROOKMAN
University of California, Berkeley

The asilid herein described as new was first brought to the writer's attention by Mr. Mont Cazier who had collected a few specimens about ten miles southeast of Livermore, California. A subsequent trip to the locality revealed that this species was quite abundant, flying rather sluggishly through the tall, dry grass stems, upon which it rested and awaited its prey. The prey, noted in several instances, included leafhoppers, buprestids of the genus *Acmæodera*, and several kinds of small Diptera and Hymenoptera.

The writer is indebted to Mr. Cazier who loaned material for this study, who has been of assistance in drawing up this description, and for whom the new species is gratefully named, to Professor W. B. Herms, Dr. E. G. Linsley, Dr. T. H. G. Aitken and Mr. C. D. Michener who read the manuscript and who offered valuable suggestions for its improvement, and to Dr. S. W. Bromley for verifying the status of this species.

Stenopogon (Stenopogon) cazieri Brookman, new species

This is a medium sized, slender, dark colored species, having a black mystax and a bare postnotum. It is related to *Stenopogon jubatus* Coquillett[1] and *Stenopogon jubatoides* Bromley[2].

Male. *Head* black; face with golden, sericeous pubescence on gibbosity, yellow pollinose from above gibbosity to antennæ; mystax entirely black; antennæ black, thinly pruinose, bristles on first two segments black, third segment one and one-half times as long as first two together, style three-eighths as long as third segment, tapering distally and bearing short, terminal spine; front yellow pollinose with black bristles; ocellar tubercle with tuft of black bristles; palpi and proboscis shining black, palpi with black hairs, proboscis bearing long, slender black and silvery hairs; occipital arch silvery pollinose, dorsally with long, black bristles, ventrally with both black and silver hairs; beard largely of black hairs interspersed with silvery hairs. *Thorax* black, brownish pollinose; prothorax with black bristles and black and silver hairs interspersed; mesonotum bearing black macrochætæ and microchætæ; humeri with slender black bristles and few silvery hairs; postalar calli with strong, black bristles, some silvery hairs dorsally; sternopleuron with a tuft of long, slender, pale hairs; scutellum

[1] Coquillett, D. W., 1904, Invertebrata Pacifica, 1:38.
[2] Bromley, S. W., 1937, Jour. N. Y. Ent. Soc., 45:297.

with stout black marginal bristles; postnotum entirely bare. *Legs*: coxæ black, brownish pollinose, with long black bristles and hairs projecting anteriorly, posterior edge with silvery hairs; femora black, distal tips rufous, bearing black bristles and slender silvery hairs; tibiæ black, proximal three-eighths rufous, all setæ black; tarsomeres rufous with black tips, setæ black. *Wings* fumose; basal area including proximal three-fourths of first basal, all of second basal, anal, and axillary cells, and alula frosted in appearance; costal margin clothed with short black, scale-like hairs. *Abdomen* shining black, tergites edged with dark gray pollen, thickly covered with rather long, slender, silvery-white hairs; lateral eminences of first tergite densely pilose, bearing many slender black, few pale bristles dorsally and strong pale bristles and silvery hairs laterally; sternites gray pollinose on anterior edges and on central, subcircular area at posterior edges; terminalia black; lateral lobes of ninth tergite about as long as greatest height of terminalia, rounded apically, bearing slender black bristles; ninth sternite five-sixths as long as tergite, posterior margin deeply and widely incised, producing U-shaped notch, postero-lateral lobes thus formed slender, projecting laterally, curving dorsally, basal portion with few black bristles tipped with silver, lobes with pale hairs. Total length, 20.5 mm.; abdomen, 14 mm.; wings, 14 mm.

Female. Similar to male but in general with more pale hairs and bristles; wings with less extensive frosted area at base; pile of abdominal tergites shorter, less dense; no pale bristles on lateral edges of first tergite; posterior edge of sixth tergite, all of seventh and eighth tergites with short black hairs; ovipositor with black spines. Total length, 23 mm.; abdomen, 17 mm.; wings, 15 mm.

Holotype, male, No. 5115, and allotype, female, No. 5116, Mus. Calif. Acad. Sci., Ent., collected 10 miles southeast of Livermore, Alameda County, California, May 10, 1940 (M. A. Cazier and A. E. Michelbacher). Paratopotypes: one male, five females, May 2, 1936 (M. A. Cazier); fifteen females, sixteen males, May 10, 1940 (M. A. Cazier and A. E. Michelbacher); thirty-nine females, twenty-seven males, May 12, 1940 (M. A. Cazier, C. D. Michener and B. Brookman). Paratypes: two males, two females, summit Mount Hamilton, Santa Clara County, California, May 19, 1940 (W. C. Reeves and M. A. Cazier). Paratypes have been deposited in the following collections: University of California, Berkeley; California Academy of Sciences; United States National Museum; American Museum of Natural History; S. W. Bromley; M. T. James; M. A. Cazier; T. H. G. Aitken and B. Brookman.

Stenopogon cazieri may be readily separated from *Stenopogon jubatus* Coq. by the predominance of black hairs and

bristles on the occipital arch, the beard and the legs, and by the brown pollinose mesonotum. Males may be separated by the shape of the lateral lobes of the ninth tergite, those of *cazieri* appearing (from lateral view) stout, broadly rounded apically, and not curving ventrad to any extent, while those of *jubatus* are more slender, taper acutely toward the apex and have the apical half curved ventrally. In addition to other characters, the females of *cazieri* retain the basal frosted area of the wing; this area is completely absent in the female specimens of *jubatus* at my disposal.

This species is distinguished from *Stenopogon jubatoides* Brom. by the following characters: the hairs and bristles of the occipital arch, beard and legs are predominantly black, while those of *jubatoides* are white; the third segment of the antennæ is relatively short (from one to one and one-third times the length of the first two segments together) and bears a ventral excision along the apical half, while that of *jubatoides* is relatively long (from one and one-half to two times the length of the first two segments together) and bears a ventral excision along the apical two-thirds or more; the antennal style is relatively long (from one-third to one-half as long as the third segment), while that of *jubatoides* is relatively short (from one-fifth to one-sixth as long as the third segment). In addition the males may be separated by the shape of the posterior notch of the ninth sternite, that of *cazieri* being deeply and widely incised and U-shaped with the inner edges of the postero-lateral lobes subparallel, that of *jubatoides* being shallowly notched and more V-shaped with the inner edges of the postero-lateral lobes widely divergent apically.

In the long series at hand there is a surprisingly small amount of variation in color and structure. This is particularly true of the males. In length the males vary from about 17 mm. to 21 mm. The females, in general, are larger than the males, varying from 18 mm. to 25 mm. in length. The latter have more light colored pile on the head and thorax than the males, a few specimens approaching *Stenopogon jubatoides* in the amount of white pile present. There is a certain amount of variation in the relative proportions of the antennal segments, but in no instance did these proportions approach those found in *Stenopogon jubatoides*. There are at hand four specimens from Sunset Valley, Santa Barbara County, California, which have the wing membrane infuscated only along the veins, but which, in all other respects, appear identical to the Livermore specimens.

A NEW AMERICAN SUBGENUS AND SPECIES OF AËDES

(Diptera, Culicidæ)

BY THOMAS H. G. AITKEN

University of California, Berkeley

The writer wishes to take this opportunity of expressing his appreciation to Mr. W. H. W. Komp for his help and criticism in the preparation of the manuscript; helpful criticism by Mr. M. A. Cazier and Mr. B. Brookman is also acknowledged. Thanks are especially due Dr. and Mrs. A. E. Michelbacher and Mr. E. S. Ross, the collectors from whom the specimens were obtained for study.

The description of the subgenus is so arranged that the diagnostic portion includes the main characters used by Edwards (Gen. Insct., Fasc. 194:130, 1932) in his key to the females of the subgenera of *Aëdes*; thus the reader will be able to refer directly to the most closely allied subgenera.

Kompia Aitken, new subgenus

Wings without a tuft of very long scales at extreme base; tarsal claws toothed on front and middle legs; cerci short; eighth abdominal segment large and not completely retractile, eighth sternite large and prominent; entire body highly ornamented; head mainly clothed with broad, flat scales, but with a median dorsal stripe of narrow scales; post-spiracular setæ absent.

Head without setæ on occiput except for ocular row; eyes narrowly separated above antennæ, space between eyes occupied by narrow scales; antennæ slender in female, verticels moderately long, flagellar segments about equal in length; proboscis slender, slightly longer than fore femora; palpi about one-sixth as long as proboscis. *Thorax* with anterior pronotal lobes widely separated; dorsocentral setæ (including pre-scutellars) present; spiracular and post-spiracular areas devoid of setæ, the latter area adorned with patch of broad, flat scales; sternopleural setæ sparse; lower mesepimeral setæ absent; meron with upper margin above level of base of hind coxæ; scutellum trilobed, scales broad on median lobe, extremely narrow on lateral lobes (each bearing setæ); postnotum bare; wing scales predominantly narrow, upper surface of stem vein without hairs, squama completely fringed, anal vein reaching well beyond base of cubital fork; pulvilli absent. *Legs* with toothed claws on fore and mid tarsi. *Abdomen* pointed.

Type: *Aëdes* (*Kompia*) *purpureipes* Aitken, new species.

Although lacking postspiracular bristles, this subgenus belongs in the genus *Aëdes*, on the basis of the characters outlined above. Unfortunately the absence of males and larvæ prevents determining its true relationship. *Kompia* appears to be most closely related to the subgenera *Finlaya* and *Howardina*, particularly the former, from which it may be separated by the absence of postspiracular bristles; it also differs from *Howardina* in this character, as well as by having toothed tarsal claws on the front and middle legs of the female. The writer takes great pleasure in naming this subgenus in honor of Mr. W. H. W. Komp, Senior Medical Entomologist, U. S. Public Health Service, who has done much to further our knowledge of neotropical mosquitoes, and who confirmed the writer's opinion concerning the status of this mosquito.

Aëdes (Kompia) purpureipes Aitken, new species

Female. *Head* with proboscis and palpi clothed with appressed black scales having dark, metallic blue shade in certain lights; clypeus bare, shiny black; antennæ black, tori shiny black with patch of broad silvery scales mesially; occiput with dark integument, heavily clothed with scales arranged in the following pattern: a dark, metallic clump on lateral ocular margins surrounded by pale band (the scales in front silvery and those in back golden), a submedian dark, metallic purple clump and a median patch of narrow, golden scales which become silvery between the eyes, a clump of erect, forked, black scales posteriorly, ocular margins bordered by few black setæ. *Thorax* with integument ochraceous orange; mesonotum golden-yellow, with two dark submedian longitudinal stripes from anterior margin to scutellum, and with two dark lateral stripes extending from scutellum half way to anterior margin, the two submedian dark stripes separated anteriorly by a median line of golden scales half the width of each stripe, posteriorly by the bare ante-scutellar space which is lined laterally with silvery scales, submedian dark stripes with few dark dorsocentral setæ, stouter, longer and more numerous posteriorly, margins of mesonotum lined with pale setæ, more numerous above wing-base; scutellum with median lobe bearing clump of broad silvery scales and six long, pale setæ, lateral lobes with small patch of narrowly-linear, elongate, black scales and five or six very long pale setæ; anterior pronotal lobes capped with broad silvery scales and clump of variably colored setæ (about 15), posterior pronotum with patch of broad silvery scales followed by five variably colored setæ; pleuræ (inclusive of pronotum and coxæ) marked by three longitudinal silvery white stripes, formed of broad scales on proepisternum, mesanepisternum, sternopleuron and mesepimeron, setæ

(pale) arranged as follows: proepisternum (about six), mesanepisternum *without* setæ, sternopleuron with two groups, upper and lower (about three each), prealar area (about seven), upper mesepimeron (about 15); coxæ yellow, clothed with broad silvery scales, darker ventrally, also each with a row of pale and dark setæ; trochanters yellow, with a few silvery scales; femora yellow on basal third, the pale color tending to run out to the apex on inner side of first two pairs of legs, remainder of femora adorned with dark, metallic purple scales, apex of femora with a patch of white scales; tibiæ and tarsi clothed with dark metallic scales varying from purple to spectrum blue (depending on light), pale bands absent; few pale setæ occurring along length of leg; tarsal claws of first two pairs of legs with tooth, those of hind legs simple, formula 1.1-1.1-0; wings clothed with narrow, dark scales, which in certain lights take on the bluish-purple color of the legs (this color also visible on wing membrane); halteres yellow, with few pale silvery and dark scales on knob. *Abdomen* with ochraceous yellow integument, adorned with broad, brown scales which in certain lights are metallic purple and in others yellowish; tergites with slight indications of narrow, pale basal bands which expand laterally into triangular areas of silvery scales, pale setæ present on first tergite and apices of following tergites; sternites with brown scales similar to those on dorsum, pale setæ present on disc as well as apices of sternites.

Holotype, female, No. 5155, Calif. Acad. Sci., Ent., collected at Triunfo, Distrito del Sur, Baja California, México, July 7, 1938, by A. E. Michelbacher and E. S. Ross. Paratypes, three females from five miles west of San Bartolo, Distrito del Sur, July 13, 1938, and one female from Miraflores, Distrito del Sur, July 8, 1938, by A. E. Michelbacher and E. S. Ross. Paratypes (unfortunately rather badly rubbed) deposited in the California Academy of Sciences, United States National Museum, University of California and the Escuela Nacional de Ciencias Biologicas, México, D.F. All collections were made at night.

An additional female specimen has recently come to hand, collected by Mr. E. S. Ross at Patagonia, Santa Cruz County, in southern Arizona, August 8, 1940. Although rather badly rubbed, the specimen appears identical with those from Lower California. The postspiracular setæ are absent, the pleural bands formed by the silvery scale patches are in evidence, the thorax is distinctly yellow and retains a few of the yellow mesonotal scales, and the legs are clothed with dark scales, but they are

not so markedly metallic purple. The specimen, caught in the daytime, was in the act of biting.

Dr. Alan Stone, U. S. National Museum, has kindly compared the specimens from Lower California and Arizona with Dyar's types of *Aëdes muelleri* (Ins. Insc. Mens., 8:81, 1920), from the vicinity of México City, México, and *A. iridipennis* (Ins. Insc. Mens., 10:92, 1922), from the Chiricahua Mountains, Arizona, and finds them to be very different; the absence of postspiracular bristles is alone sufficient to distinguish the former.

Obituary

During the past year entomology has lost several of its most distinguished workers. Of the younger entomologists, Grace Adelbert Sandhouse, aculeate Hymenopterist in the Bureau of Insect Identification of the U. S. D. A., died on Nov. 9, 1940, at the age of 44 and F. W. Edwards, Dipterist and Deputy Keeper of Entomology at the British Museum (Natural History), died on Nov. 15, 1940, at the age of 46.

Older scientists whose names have been intimately associated with American entomology for the last half century include: W. S. Blatchley, naturalist and author of several indispensible insect manuals, who died on May 28, 1941, at the age of 81; Samuel Henshaw, Coleopterist, bibliographer, and director emeritus of the Museum of Comparative Zoology, who died on Feb. 5, 1941, at the age of 89; Ch. Wardell Stiles, Parasitologist and for many years secretary of the International Commission on Zoological Nomenclature, who died on Jan. 24, 1941, at the age of 73; Charles William Leng, Coleopterist, cataloguer, and director of the Public Museum, Staten Island, N. Y., who died on Jan. 25, 1941, at the age of 81; and Clarence P. Gillette, authority on the Aphididæ and director emeritus of the Colorado Agricultural Experiment Station, who died on Jan. 4, 1941, at the age of 81.

Contributors to early California entomology include: Gustavus A. Eisen, early collector in Lower California and one of the persons responsible for the introduction of the Blastophaga into California, who died on Oct. 29, 1941, at the age of 93, and Edward M. Ehrhorn, charter member of the Pacific Coast Entomological Society and one of the pioneers in Plant Quarantine work in San Francisco, who died on Feb. 11, 1941, at the age of 79.—Robert L. Usinger.

NOTES ON THE DISTRIBUTION AND HABITS OF REDUVIID VECTORS OF CHAGAS' DISEASE IN THE SOUTHWESTERN UNITED STATES

(Hemiptera, Reduviidæ)

BY SHERWIN F. WOOD
Los Angeles City College

INTRODUCTION

For the past eight years, the writer has been collecting cone-nosed bugs of the genus *Triatoma* for examination as vectors of Chagas' disease. The observations concerning American human trypanosomiasis have appeared in various journals but most of the data relating to the insects has not been published. Preliminary reports of the early work were published by C. A. Kofoid and Fae Donat (1933), and the final report of the important results of all this early work was published by Fae Donat Wood (1934). Due to the widespread occurrence of naturally infected bugs (Wood, 1941a), it seems advisable to record this information on the occurrence and life history of the insect vectors, including unpublished notes of F. D. Wood.

The writer wishes to acknowledge the very able and generous assistance of Dr. Robert L. Usinger of the University of California at Davis in checking the identity of the various species of insects. Recent observations have been made possible by research grants from the American Medical Association (Fae D. Wood) and the American Association for the Advancement of Science (Sherwin F. Wood). The writer gratefully acknowledges the aid of the American Association which has stimulated the continuance of his research. The writer is deeply appreciative of field notes generously supplied by Dr. Fae D. Wood and of her critical review of the manuscript.

MATERIALS AND METHODS

The following cone-nosed bugs have been collected during field work in the Southwest: *Triatoma protracta* (Uhler), *T. protracta woodi* Usinger, *T. rubida* (Uhler), *T. longipes* Barber, *T. gerstæckeri* Stål, *T. heidemanni* Neiva, *T. sanguisuga* Lec., *T. indictiva* Neiva and *Paratriatoma hirsuta* Barber. All of these bugs, except *longipes*, have been taken from the nests of various species of wood rats (*Neotoma* spp.). They have become known colloquially to the writer by such common names as "bellows bugs, blood-sucking bugs, blood-suckers, suckers, Walapai Tigers (Wali's), cactus bugs, bedbugs, big bedbugs, and Chinese bedbugs."

The materials found necessary for collecting in all kinds of wood rat nests consisted of a long-handled geologist's pick, a shovel, a machete and heavy gloves. The rat nests were partly or completely torn down until all inner grass nests and surrounding twigs had been carefully examined for bugs. Although the bugs were at first collected with forceps, this method proved too clumsy compared with handling with fingers. In order to avoid possible contamination of the hands by feces of infected bugs, they were usually picked up by grasping them sidewise between thumb and finger.

Much field work has been carried out during the hottest parts of the year. At first, many bugs died during transit through the desert. Later, live insects were brought back to the laboratory successfully by protecting them from exposure to sunlight and by keeping them at lower temperatures with improvised water-evaporating coolers. Although this method has not been 100% efficient, it has saved the lives of many bugs carried long distances through the arid Southwest.

In the laboratory, the blood of white rats, *Rattus norvegicus* (Erxleben), has been used as the principal food for the insects. The rats are confined to hardware cloth cylinders of various sizes, depending upon the age of the rat, and then placed in one-half of a 10″ glass moist chamber or a 10″ x 3″ white enameled pan. One must be sure that the rat is blocked properly or it may escape and eat all the bugs. This is accomplished by inserting several wooden sticks behind the animal and binding them to the cylinder with rubber bands. A piece of cheese cloth is stretched over the top of the pan and held securely by one or two large rubber bands while the bugs feed. One can observe the bugs through the cheese cloth or the walls of the moist chamber. Unless it is desired to collect the feces of the bugs, a double strip of paper toweling about 2″ wide is placed underneath the cylinder to absorb the urine of the rat. Otherwise, a close watch must be kept of the bugs, especially small nymphs, or they may drown in the rat's urine. The insects are left with the rat for a few minutes to many hours depending upon their age, nearness of last feeding, and atmospheric temperature.

The insects are stored in straight-sided, pint, one-half pint or smaller glass jars with metal screw tops perforated with many holes small enough to prevent first instar nymphs from escaping. The bottom of each jar has at least two circular pieces of paper

toweling to absorb the feces of the bugs. Inside the jar there is a double thickness of paper toweling folded into pleats one-half to one inch across depending on the size of the jar. The paper extends to within one inch of the top of the jar, which prevents most bugs from reaching the metal top.

When not being fed, the bugs are kept on shelves away from any possible exposure to sunlight. Each jar has one serial number in two places, on the lid and on the pleated paper inside. A record is kept under this number of all data pertaining to these bugs for as long as they exist in the laboratory. Due to the fact that many of these cultures of bugs continue to live for several years, most of the data is from cultures which have died out in the laboratory.

Many types of containers have been used for field work but the most satisfactory one is that described by Wood (1941b).

Insect Vectors of Chagas' Disease

Triatoma protracta (Uhler)

Infected localities: Murray Canyon, near San Diego, San Diego County, Calif.; Eaton Canyon, near Pasadena, Los Angeles County, Calif.; Old Copper Mill Site (6 miles east of Tyrone), and 5 miles east of Tyrone, Grant County, New Mexico.

Uninfected localities: In California: Carroll Canyon, near La Jolla, San Diego County; near Del Mar, San Diego County; Verdugo Woodlands, near Glendale, Los Angeles County; Monrovia Canyon, Los Angeles County; 23 miles west of Victorville, Los Angeles County; Liebre Mountains near Sandbergs, Los Angeles County; Lower Shake Canyon, Los Angeles County; Sepulveda Canyon, Los Angeles County; and Piñon Flats, Riverside County. In Arizona: Six miles southwest of Sedona, Yavapai County; Pinery Canyon, Coronado National Forest, Cochise County; 12 miles southeast of Dos Cabezas, Cochise County; and the Alvarado Mine, near Congress Junction, Yavapai County. In New Mexico: One and five miles south of Silver City, Grant County; Tyrone, Grant County; 9 and 10 miles east of Tyrone, Grant County; and 30 miles southwest of Silver City, Grant County. In Utah: Seven miles north of Kanab, Kane County, and 10, 15, and 16 miles west of St. George, Washington County.

Throughout the southwestern United States, 1211 specimens of *Triatoma protracta* have been collected. Nine hundred and

fifty-seven have been examined of which 196 (20.48%) were found infected with *Trypanosoma cruzi* Chagas. Twelve hundred and five specimens of *protracta* were collected in wood rat (*Neotoma* spp.) nests, five in human dwellings and one in the field at night.

In the areas where only *Triatoma protracta* has been collected, the writer has taken 506 bugs from 158 rat nests, an average of 3.20 bugs per nest. The largest number of bugs from one nest was 85 in a nest at Murray Canyon. From trips in 1932, 1933, 1937, and 1939, a total of 453 *protracta* has been collected from Murray Canyon. One hundred and forty-three (31.56%) of these bugs were infected. In 1937 and 1939, only one out of nine nests from Murray Canyon failed to yield any bugs. Of the eight infested nests, four harbored infected bugs. In 1937, one hundred fifty-two bugs were collected from Eaton Canyon, of which 57 (37.50%) were infected. Rat nest records for the Eaton Canyon *protracta* show that of eleven nests examined, three did not yield any bugs. Of the eight infested nests, only three harbored infected bugs. In 1939, from five and six miles east of Tyrone, 49 bugs were collected of which two or 4.08% were infected with *Trypanosoma cruzi* Chagas. Rat nest records for the infected localities near Tyrone show that of 15 nests examined, six did not harbor any *Triatoma*. Of the nine infested nests, two harbored infected bugs.

Field records of 443 specimens of *Triatoma protracta* examined show that 92 adults, and 83 large, 162 medium, and 106 small nymphs were collected.

Life history: The data here presented are from mixed cultures of adults and nymphs of *Triatoma protracta*. Since the cultures were self-perpetuating, the age of the culture represents a longer period than the actual life cycle of the species. As can be noted above from field records, the cultures usually were started with nymphs.

In twelve cultures of *T. protracta*, maintained in the laboratory for isolation of strains of *Trypanosoma cruzi*, the age of the cultures in days varied from 320 to 1068, the average being 805 days. The number of feedings of the bugs in these cultures varied from five to 27, the average being 14. The average interval between feedings for the 12 cultures was 58 days, the extremes being 37 to 69. The longest interval between feeding which the *Triatoma* survived was 213 days, the average of the longest intervals for the 12 cultures being 155 days. These bugs

were probably large nymphs which fed to capacity at the previous feeding. One isolated adult male from another group of cultures lived 205 days on three feedings.

In another culture, four females produced 83 eggs.

The host mammals collected in nests where *Triatoma protracta* only occurred are *Neotoma fuscipes annectens* Elliot and *N. f. macrotis* Thomas in California, and *Neotoma albigula albigula* Hartley and *N. lepida lepida* Thomas from Utah.

Triatoma protracta woodi Usinger

Infected localities: Near the Chisos Mountains, Brewster County, Texas; 13 miles east of Marathon, Brewster County, Texas; and near Quemado, in the Quemado Valley, Maverick County, Texas.

Uninfected localities: (See Usinger, 1939). In Arizona: Near "Pankeyville," three miles north of the junction of State Highways 14 and 81, on 81, Cochise County; near Congress Junction, Yavapai County; and the Alvarado Mine, near Congress Junction, Yavapai County. In New Mexico: Eleven and 17 miles west of Las Cruces, Dona Ana County; 37 and 51 miles northeast of Carlsbad, Lea County; and two miles north of Socorro, Socorro County. In Texas: Four and 10 miles northwest of Bosque Bonito, Hudspeth County; 32 miles northwest of Pecos, Reeves County; 68 miles south of Marathon, Brewster County; four and 19½ miles east of Eagle Pass, Maverick County; 24 miles south of Laredo, Webb County; and 23 miles south of Catarina, Webb County.

This cone-nosed bug was referred to in a previous publication as a pale castaneous form of *T. protracta* (See Wood and Wood, 1938, p. 210). Throughout the southwestern United States, 489 *Triatoma protracta woodi* have been collected, of which 415 have been examined and 20 (4.81%) found infected with *Trypanosoma cruzi* Chagas. All of the bugs were collected in the nests of wood rats (*Neotoma* spp.).

In the areas where *Triatoma proctracta woodi* only was collected, the writer has taken 433 bugs from 59 rat nests, an average of 7.33 bugs per nest. The largest number of bugs from one nest was 76, from 13 miles east of Marathon. Near the Chisos Mountains, of 23 bugs collected one (4.34%) was infected. This involved the examination of four rat nests, one of which had no *Triatoma*. Thirteen miles east of Marathon, 142 *protracta woodi* were collected of which 18 (12.60%) were

infected. Here, nine rat nests were examined of which one had no *Triatoma*. Of the eight infested nests, five harbored infected bugs. Examination of nine bugs from the Quemado Valley revealed one infected with *Trypanosoma cruzi*.

Field records of 415 *Triatoma protracta woodi* examined show that 56 adults, and 82 large, 160 medium and 117 small nymphs were collected.

Life history: The total number of days for six mixed cultures (adults and nymphs) of *Triatoma protracta woodi* varied from 883 to 1369, the average being 1074. This involved from 10 to 17 feedings, the average being 13.5 feedings. The range of intervals in days between feedings for the six cultures was 58 to 108, the average being 80.5 days. The longest interval that any of the bugs survived was 217 days. The average of the longest intervals of the six cultures was 199 days. In another culture, one of three nymphs was raised from the egg through adulthood in 593 days on 15 feedings. The longest feeding interval this male *T. p. woodi* survived as a nymph was 129 days.

One isolated female produced 21 fertile eggs. This same female lived 202 days on five feedings. One male in another culture lived 94 days on two feedings. Another male lived 205 days on two feedings.

The host mammal collected in New Mexico from nests in which only *T. p. woodi* was found is *Neotoma albigula albigula* Hartley.

Triatoma rubida (Uhler)

Infected localities: Alvarado Mine, near Congress Junction, Yavapai County, Arizona, and Sanderson, Terrell County, Texas.

Uninfected localities: In California: Along Palms to Pines Highway, near Cathedral City, Riverside County. In Arizona: Broadway and Craycroft Avenue, Tucson, Pima County; near "Pankeyville," three miles north of the junction of State Highways 14 and 81, on 81, Cochise County; six miles southwest of Sedona, Yavapai County; Sullivan Mine, near Congress, Yavapai County; Congress Junction and vicinity, Yavapai County; and five miles west of Wickenberg, Maricopa County. In New Mexico: Eleven and 17 miles west of Las Cruces, Dona Ana County, and 30 miles southwest of Silver City, Grant County.

This cone-nosed bug was previously referred to by us (Wood and Wood, 1938, p. 210) as *Eutriatoma* (*Triatoma*) *uhleri*

(Neiva). Throughout the southwestern United States, 771 specimens of *Triatoma rubida* have been collected or sent to the writer, of which 230 have been examined and three (1.30%) found infected with *Trypanosoma cruzi* Chagas. One hundred seventy-six were collected in wood rat (*Neotoma* spp.) nests and 595 were collected in or on houses and tents.

In the areas where only *Triatoma rubida* was found, the writer has taken 19 bugs from 24 rat nests. The largest number taken from one nest was 16 near Congress Junction. Of the 135 *rubida* examined during 1939 and 1940 from the Alvarado Mine, 78 came from rat nests and 57 from the inside or outside of houses or tents. The only infected specimen was one of 78 bugs collected from 32 rat nests of which 14 did not yield any bugs. Of five female *rubida* received from a house in Sanderson, Texas, two females were infected with *Trypanosoma cruzi*.

Field records of 230 *Triatoma rubida* examined show that 87 adults, and 32 large, 86 medium, and 25 small nymphs were collected.

Life history: One laboratory culture started from a group of eggs laid by bugs collected six miles southwest of Sedona, Yavapai County, Arizona, was maintained for 1014 days. The total number of feedings was 26. The average interval between feedings was 38 days while the longest interval that one large nymph survived was 154 days. At the tenth feeding, there were 22 nymphs. At the twenty-sixth and last feeding, there was one large nymph. One nymph was fatally injured with forceps and five were eaten by the rats. Four nymphs were found dead at 685 days, one was found dead at 777 days, one at 958 days and one large nymph survived 1014 days but was too weak to feed. Nine nymphs completed metamorphosis. The life span of these adults (five males, four females) from first instar nymphs to death varied from 691 to 833 days on 20 and 21 feedings.

An isolated female *T. rubida* lived 58 days on two feedings and deposited 61 fertile eggs. In another culture, three females deposited 129 eggs. In a different culture, two females collected as adults lived 63 days on four feedings and deposited 87 eggs. Another isolated female lived 59 days on two feedings and deposited 38 eggs. In another culture, one female lived 49 days on three feedings while a second female lived 63 days on three feedings.

During the early evening of May 30, 1940, the writer observed *Triatoma rubida* and *T. longipes* in flight at the Alvarado

Mine in Arizona. As soon as it became dark, close watch was kept of our tent walls, and the window screens of one miner's house. Usually, the noise of the insect as it flew by or hit the screen or tent wall attracted our attention. They seemed to come down canyon with the warm wind. The writer projected a flashlight beam into the air at about a 45° angle and *Triatoma* could be spotted as they flew across this light beam. Sixteen adults (12 *rubida*, 4 *longipes*) were collected on this night. The following night, 29 adults (26 *rubida*, 3 *longipes*) were collected. On both occasions, bugs were prevalent in the early evening. About 9:30 p. m. the wind became cool and the *Triatoma* no longer could be found, although the next morning several were collected inside the tent.

The host mammal taken in nests in Arizona where only *Triatoma rubida* were collected was *Neotoma albigula albigula* Hartley.

Triatoma longipes Barber

The only locality where the writer has collected this bug is the Alvarado Mine, near Congress Junction, Yavapai County, Arizona. From this area, the writer has collected or received for examination during 1939 and 1940, 152 *Triatoma longipes* of which 62 were examined and 10 (16.12%) found infected with *Trypanosoma cruzi* Chagas. One hundred forty-eight were collected in or on houses or tents, two were taken on sleeping bags, one was found in a mine shaft near the entrance and one was collected under a large rock slab of a big boulder.

Field records of 62 *Triatoma longipes* examined show that 59 adults and three large nymphs were collected.

Life history: One culture of 12 adult *Triatoma longipes* (four females, 8 males) was maintained for 85 days at which time four adults (three males, one female) were still alive. This was during summer weather in a reinforced concrete building. The number of feedings was seven and the feeding interval averaged 11 days with 19 days as the longest interval between feedings. One of the males in this culture lived 23 days, another male and three females lived 34 days whereas three males and one female lived longer than 85 days.

In another culture, one male lived 111 days on five feedings. One female of a different culture lived 75 days on four feedings. This same female, the only one in the culture, deposited 157 eggs.

Triatoma gerstæckeri (Stål)

Infected localities: Quemado Valley, near Quemado, Maverick County, Texas, and 25 miles northwest of Hondo, Medina County, Texas.

Uninfected localities: Five and one-half miles north of Salineno, Starr County; two and six-tenths miles south of Faysville, Cameron County; two miles south of Faysville, Hidalgo County; five and five-tenths miles east of Benavides, Duval County; one mile west of Realitos, Duval County; four miles east and nine miles west of Aguilares, Webb County; two miles west of Webb, Webb County; 23 miles south of Catarina, Webb County; two miles south of Asherton, Dimmit County; and Sanderson, Terrell County, all in Texas.

Fifty-five *Triatoma gerstæckeri* were received or collected of which 54 were examined and three (5.55%) found infected with *Trypanosoma cruzi* Chagas. Fifty-two of these bugs came from wood rat (*Neotoma* spp.) nests and three came from houses.

In areas where only *gerstæckeri* was found, the writer collected 14 bugs from 18 wood rat nests. The largest number collected from any one nest was 13 in a nest 5.5 miles east of Benavides. Two large nymphs from the Quemado Valley and one female received from a house 25 miles northwest of Hondo were found infected with *Trypanosoma cruzi.* Of 12 wood rat nests examined in the Quemado Valley, only two harbored bugs and one of these contained the infected nymphs.

Field records of 54 *Triatoma gerstæckeri* examined show that three adults, and 22 large, 15 medium and 14 small nymphs were collected.

Life history: One laboratory-raised female lived 119 days on five feedings. In another culture, a male lived 53 days on two feedings, while another male lived 119 days on five feedings. In a different culture, one female collected in the field lived 40 days in the laboratory on one feeding.

Triatoma heidemanni Neiva

Uninfected localities: Twenty-three miles south of Catarina, Webb County, Texas, and two miles south of Asherton, Dimmit County, Texas.

Thirteen *Triatoma heidemanni* were collected in wood rat nests. All were examined and found to be negative for *Trypanosoma cruzi.* There were two adults (one male, one female), and eight medium and three small nymphs.

Life history: In a laboratory culture, one male lived 71 days on four feedings at intervals of 14, 7 and 18 days while another male lived 228 days on nine feedings at intervals of 7, 18, 29, 40, 14, 46, 21 and 14 days.

Triatoma sanguisuga Leconte

Uninfected localities: Five and five-tenths miles east of Benavides, Duval County, Texas; one mile west of Realitos, Duval County, Texas; and four miles east of Aguilares, Webb County, Texas.

Ten *Triatoma sanguisuga* were collected in wood rat nests. All were found negative upon examination. There was one adult female, and seven medium and two small nymphs.

Life history: In one laboratory culture, a female lived 155 days on four feedings at intervals of 64, 20 and 13 days.

Triatoma indictiva Neiva

Uninfected localities: 5.5 miles east of Benavides, Duval County, Texas, and "The Pines," Tyrone, Grant County, New Mexico.

Four medium-sized nymphs of *Triatoma indictiva* were collected in wood rat (*Neotoma* spp.) nests.

Life history: One female *Triatoma indictiva* from near Benavides lived 257 days on 9 feedings. The longest interval between feedings was 46 days, the average being 25 days. Two females from Tyrone lived 15 days after completing metamorphosis during the summer. Another male from Tyrone lived 47 days after feeding on a large nymph of *Triatoma protracta* which had recently fed. This is the first instance of cannibalism ever seen in the cultures. The large nymph of *protracta* seemed annoyed by the contact but the *indictiva* followed it wherever it went, keeping its proboscis tip in contact with the underside of the abdomen and evidently continued feeding. In a few minutes, the bugs were separated and the wing tips of the *indictiva* were well elevated above the end of its abdomen which was partly distended. The *T. protracta* nymph was not noticeably deflated even after the feeding of the *indictiva*, but there was less tension on the skin of its abdomen. On the abdomen, at the point of contact with the proboscis, there was a small droplet of clear fluid after the *indictiva* had moved away.

(To be continued in next number)

THE OVIPOSITION OF CONOPID FLIES UPON SMALLER ANDRENID BEES

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The following observations were made at Berkeley, California, in February, 1937 and 1938. A species of conopid fly, *Myopa rubida* Bigot, was seen to oviposit in several species of andrenid bees. In one instance an *Andrena complexa* Viereck was crowded from a blossom of *Ranunculus californicus* Benth. by one of these parasites which then followed directly behind the bee and seized it in flight at a distance of two or three yards from the flower. The fly grasped the bee's thorax and carried the bee in a straight line for about twenty feet, then released hold and flew away. At this point the fly was captured and ascertained to be a female. Since the bee escaped, the exact placement of the egg was not determined. The same procedure was observed nearby on a *Brassica campestris* Linn. blossom with an undescribed black *Andrena.*

The following year several conopids were found pursuing *Andrena* of different species around the branches of blooming *Salix* trees. In all cases the conopid followed the intricate flight path of its quarry before capturing it. An *Andrena pallidiscopa* Viereck was captured together with its parasite but examination revealed that oviposition had not yet been accomplished.

Published observations on the oviposition of conopids have generally been confined to that upon larger insects, such as *Bremus* and *Vespula*,[1] or *Bembix*.[2] The remarkable feature of the attack upon *Andrena* is the usual size discrepancy in favor of the parasite. The *Andrena complexa* observed was not more than half the size of its aggressor and a smaller but still noticeable size difference occurred between *Andrena pallidiscopa* Viereck and its parasite. The larvæ of these flies must find enough food in the abdomens of their adult hosts to complete development. Such a ratio of size of parasite to size of prey is exactly the opposite of the condition usually found in insects.

Three possible explanations of this condition are discussed below. First, there must be a very complete utilization of the abdominal contents of the bee. A dead *Andrena* containing a

[1] Meijere, V. C. 1903. Beitrag zur Kenntniss der Biologie und der Systematischen verwandtschaft der Conopiden. Tijdsch. voor Ent. 46:144-225.

[2] Bohart, G. E. and J. W. MacSwain. 1939. The life history of the sand wasp, *Bembix occidentalis beutenmuelleri* Fox and its parasites. Bull. South. Calif. Acad. Sci. 38:84-98.

conopid puparium has its greatly distended abdomen completely filled by the parasite. In addition, nectar taken by the bee is probably absorbed by the larva. This might even cause an increase in the appetite of the bee. Second, a conopid undergoes considerable expansion after emergence. This can be demonstrated by comparing the small, shriveled appearing pupa of *Myopa* taken from its puparium with a fully developed and expanded adult. Hence it seems logical to suppose that the parasite has a lower specific gravity than its host. Third, there is a great variation in the size of adult conopids of the same species. This may amount to a doubling in size of the largest example over that of the smallest. Inasmuch as these flies are not host specific, we may postulate that large specimens developed in large *Andrena* while small conopids developed in small host species, regardless of the size of their parents.

Winter Insect Collecting in Mexico

The results of two weeks' collecting by H. Welsh, Thurman Crawford and the authors in Mexico, starting December 23, 1940 indicated that at this season general insect collecting is very profitable in the more humid areas. Along the route covered from Laredo, Texas, to Mexico City and east to Vera Cruz, good collecting was encountered almost anywhere in the territory south of Valles and east of the Sierra Madre Orientale. On the mountain slopes and in the canyons, especially west of Tamuzunchale where the Pan-American highway ascends to the Mexican Plateau and in the Orizaba Valley near Cordoba, many plants were in bloom and conditions were ideal for all sorts of flying insects. In the lowland forests, night beating for leaf-feeding insects, sweeping for shade-dwelling Diptera, and pulling apart rotten wood for fungous feeders was usually successful.

In the semi-arid region north of Valles, which enjoys a wet season in the summer and early fall, conditions were too dry for most orders of insects. However, in spite of the lack of flowers and fresh vegetation, butterflies were very abundant in this area. Similarly, the high arid country of the Mexican Plateau and the upland coniferous forests bordering it were too dried out even though the weather was sufficiently warm for flying insects.

Since nights were cool everywhere, collecting by lantern was limited mainly to insects feeding or resting nearby.—G. E. Bohart and N. Stahler.